Molecular Level Pathways to Synthesis of High Quality Compound Semiconductor Films

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This paper presents a new approach for relatively rapid and inexpensive synthesis of morphologically homogenous semiconductor films that without high-temperature treatment. The approach, molecular layer electrodeposition, combines the low-cost, scale-up and environmental advantages of electrodeposition with the atomic level control of epitaxial deposition. The method entails building a superlattice comprising monolayers of a compound by electrodeposition from a single electrolyte. The monolayer deposition approach extends the utility of epitaxial methods to device fabrication with simpler apparatus and practical deposition rates. The paper outlines the concepts underlying molecular layer electrodeposition, describes the special deposition apparatus and presents the results of initial investigations involving the synthesis of binary and ternary compounds based on Cu-In-Se in a flow cell, controlled at molecular level